



**National  
Transportation  
Safety Board**

# Enhancing Transportation Safety: Addressing Fatigue, Shiftwork, and Sleep Disorders

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Board Member**

**Kentucky Sleep Society  
October 27, 2012**



- 1) determining the probable cause of transportation accidents**
- 2) making recommendations to prevent their recurrence**



**NTSB**





All Modes



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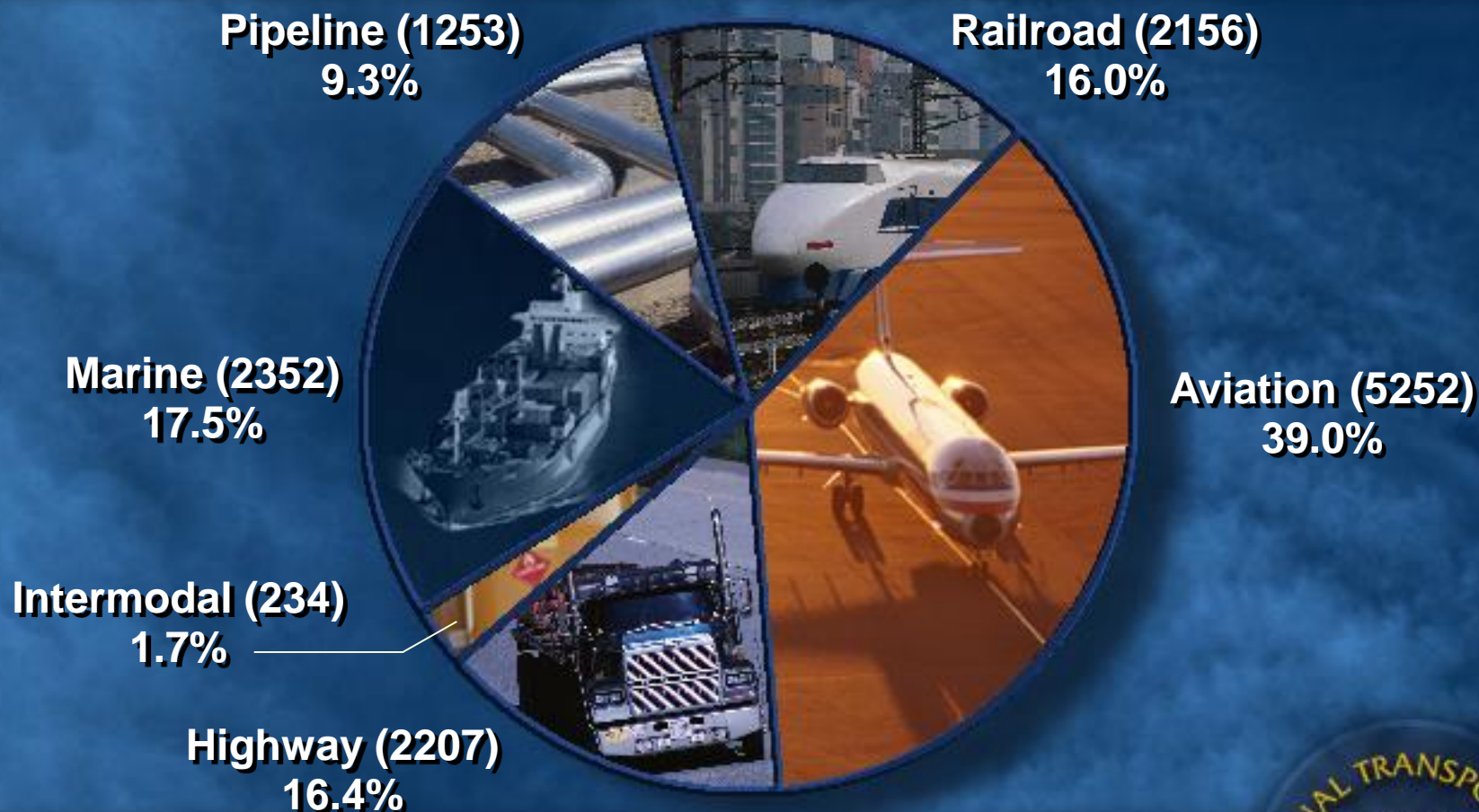
# Independent Federal Agency: Created in 1967

- ~ 132,000 accident investigations
- 13,500+ safety recommendations
- ~ 2,500 organizations/recipients
- 82% acceptance rate

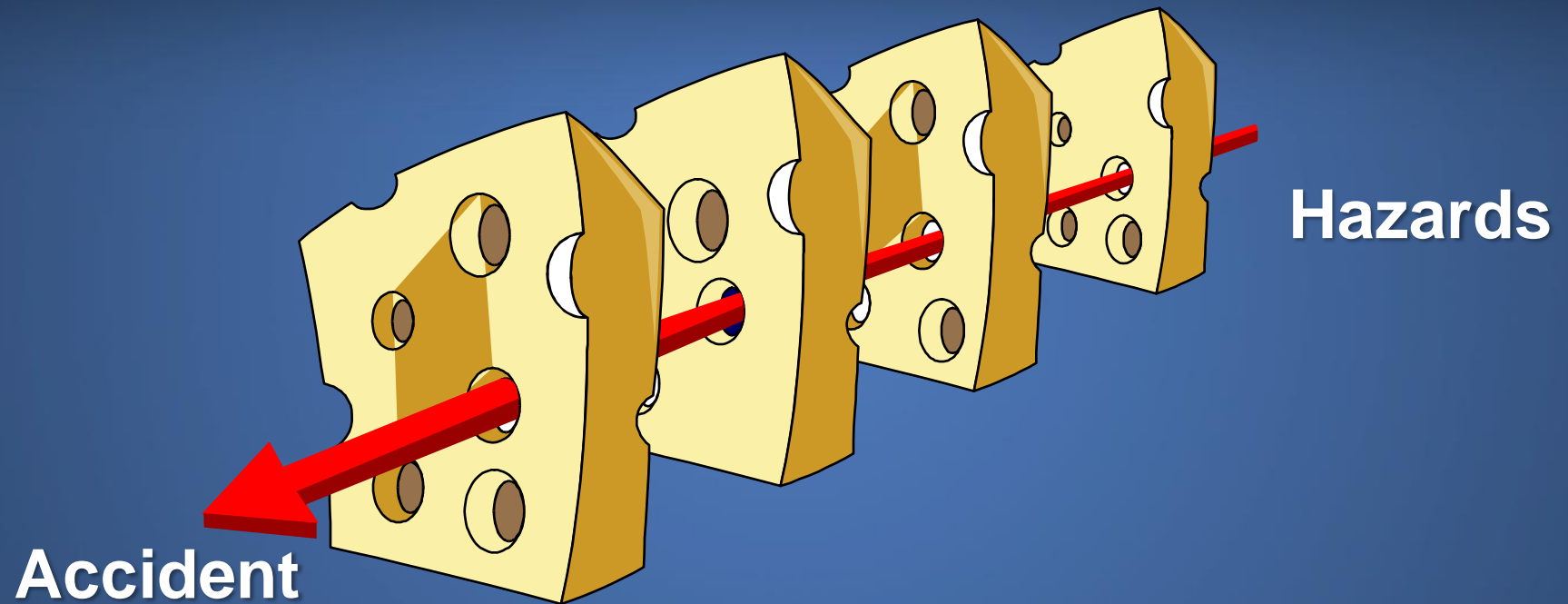




# 13,454 Safety Recommendations issued since 1967



# “Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards



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# NTSB Go Team: 24/7/365

- Individual investigator
- Regional/limited team
- Major launch/Board Member





# Key On-scene Events



## Organizational Meeting

- Designate parties and party coordinators
- Establish and organize groups

## Progress Meetings

- Summarize findings
- Info for briefings

## Family Briefings

## Press Briefings



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# NTSB Investigative Process



## On-scene Investigation

Organizational Meeting  
Groups and Parties  
Progress meetings  
Media Briefings  
Press Releases

A screenshot of the NTSB Form 820 (Preliminary Report) for Continental Airlines Flight 3407. The form includes fields for aircraft information, flight details, and a narrative section. The narrative describes the crash of the aircraft on Buffalo Niagara International Airport (BNF) on February 12, 2009, at 22:16:30. The aircraft was a Bombardier CRJ-900, registration N229CQ, and was operating as a scheduled flight from New York City to Buffalo, New York. The report mentions that the aircraft was cleared for a visual approach to the airport and that the crew was not aware of any weather conditions at the time of the accident.

## Preliminary Report

Factual information



## Public Hearing

Fact finding  
Depositions  
Witnesses  
Docket



## Board Meeting

Docket  
Findings  
Conclusions  
Probable Cause  
Safety Recommendations



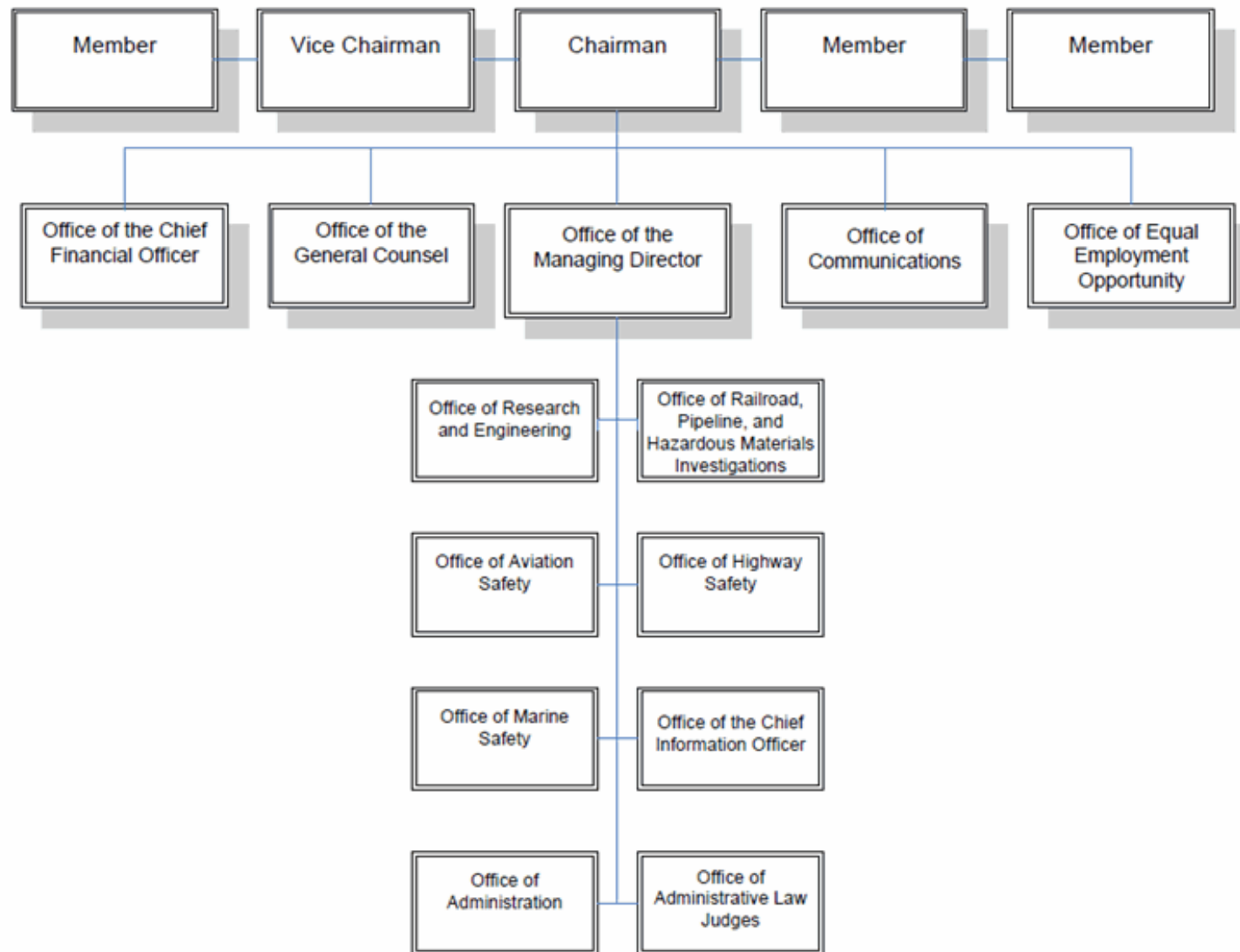
## Final Report

**Government in the Sunshine Act**



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# NATIONAL TRANSPORTATION SAFETY BOARD





# NTSB: The Board

- Five Members:
  - President nominates
  - Senate confirms



Mark Rosekind  
Member



Chris Hart  
Vice Chairman



Debbie Hersman  
Chairman



Robert Sumwalt  
Member



Earl Weener  
Member



# NTSB Characterized as:

‘moral compass and industry conscience’

NTSB Chairman Deborah A.P. Hersman



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#1: Fatigue is a safety risk.



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# Miami, Oklahoma (June 26, 2009)

- Initial minor accident (~1:13 pm)
  - blocked eastbound I-44
- 2008 Volvo truck-tractor (~1:19 pm)
  - refrigerated semitrailer
  - traveling eastbound on I-44
  - 69 mph with cruise control engaged
  - without slowing or braking collided into queue of slowing & stopped vehicles



# Fatigue Factors

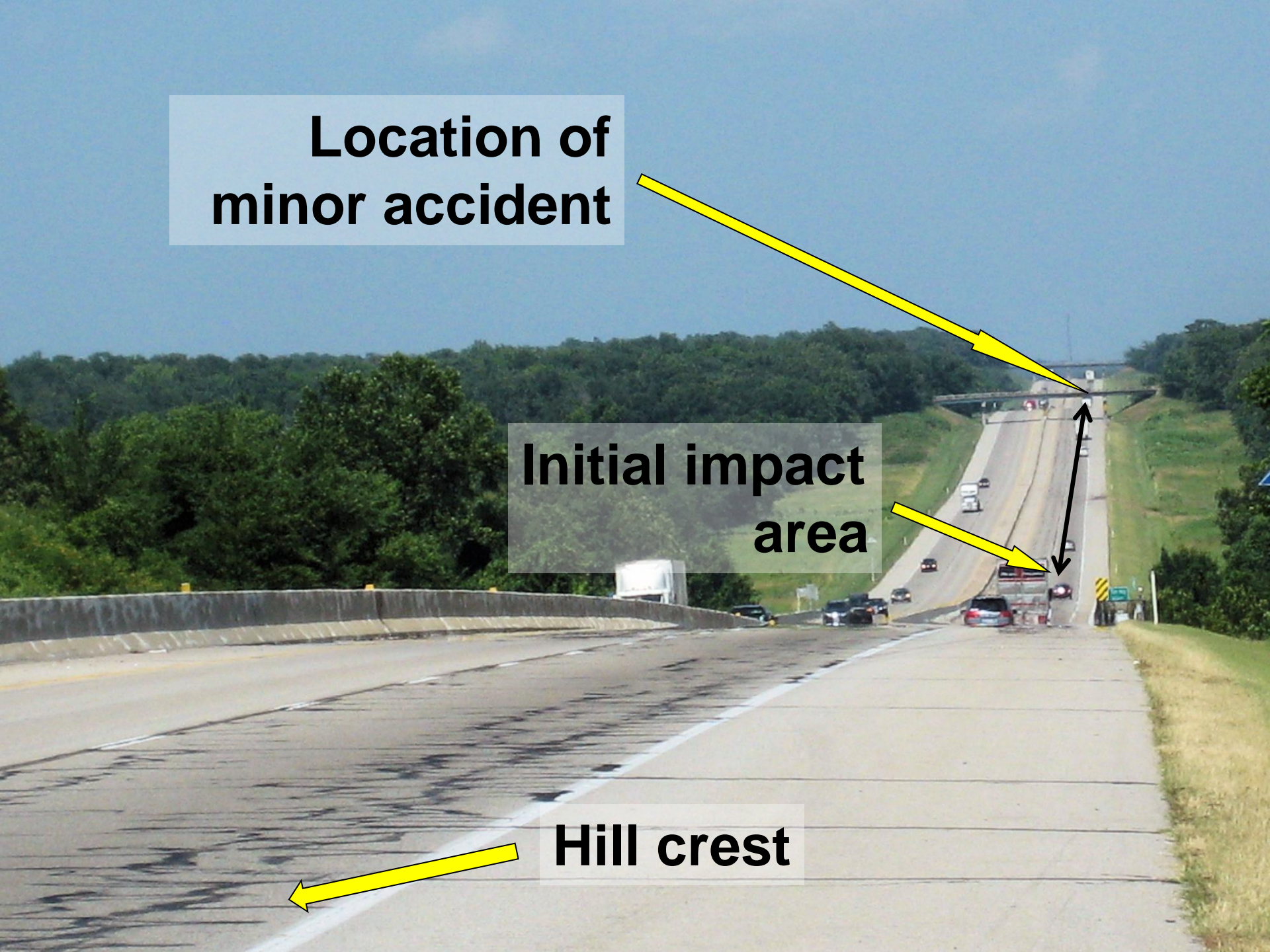
- Off work for 3 weeks: day active/night sleep schedule
- 3am to 3pm shift work/drive schedule (since 1997)
- Early bedtime (2 hr phase advance in sleep time)
- Obtained min 3 hrs/max 5 hrs sleep prior to accident
- Subsequently diagnosed with mild sleep apnea



**Location of  
minor accident**

**Initial impact  
area**

**Hill crest**







**Hill crest**

**Initial impact area**



# Miami, OK (June 26, 2009)

10 fatalities  
3 serious injuries  
2 minor injuries  
5 no injuries



# Probable Cause (fatigue)

“ . . . driver’s fatigue, caused by the combined effects of acute sleep loss, circadian disruption associated with his shift work schedule, and mild sleep apnea, which resulted in the driver’s failure to react to slowing and stopped traffic ahead by applying the brakes or performing any evasive maneuver to avoid colliding with the traffic queue. . . . ”







**National  
Transportation  
Safety Board**

## **Track Path Animation**

Collision Between Two BNSF Railway Freight Trains

Red Oak, Iowa

April 17, 2011

DCA11FR002



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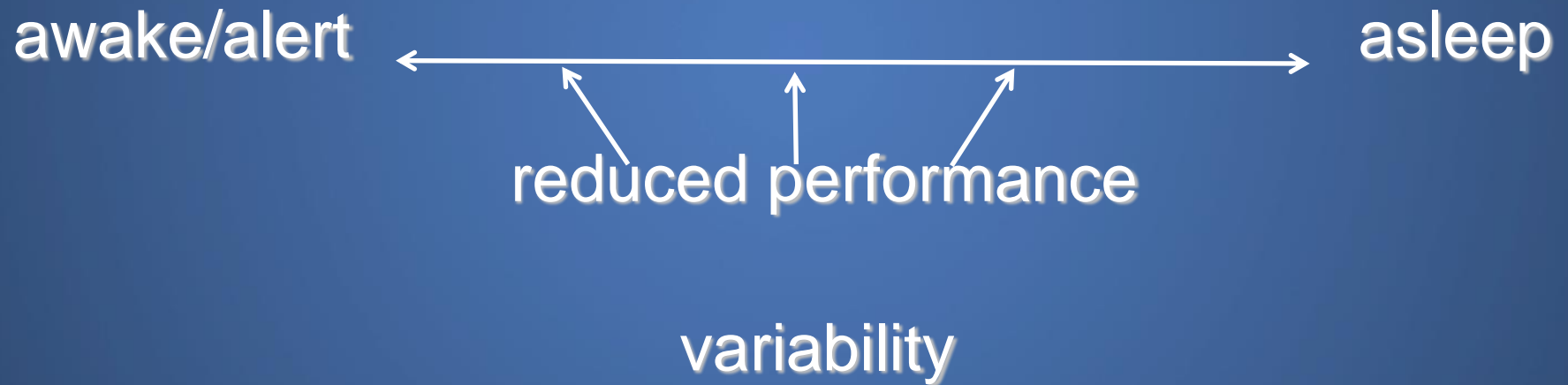


# Probable Cause (fatigue)

“ . . . failure of the crew of the striking train to comply with the signal indication requiring them to operate in accordance with restricted speed requirements and stop short of the standing train because they had fallen asleep due to fatigue resulting from their irregular work schedules and their medical conditions.”



# Fatigue Risks



# Fatigue Risks

- degraded 20 – 50%+:

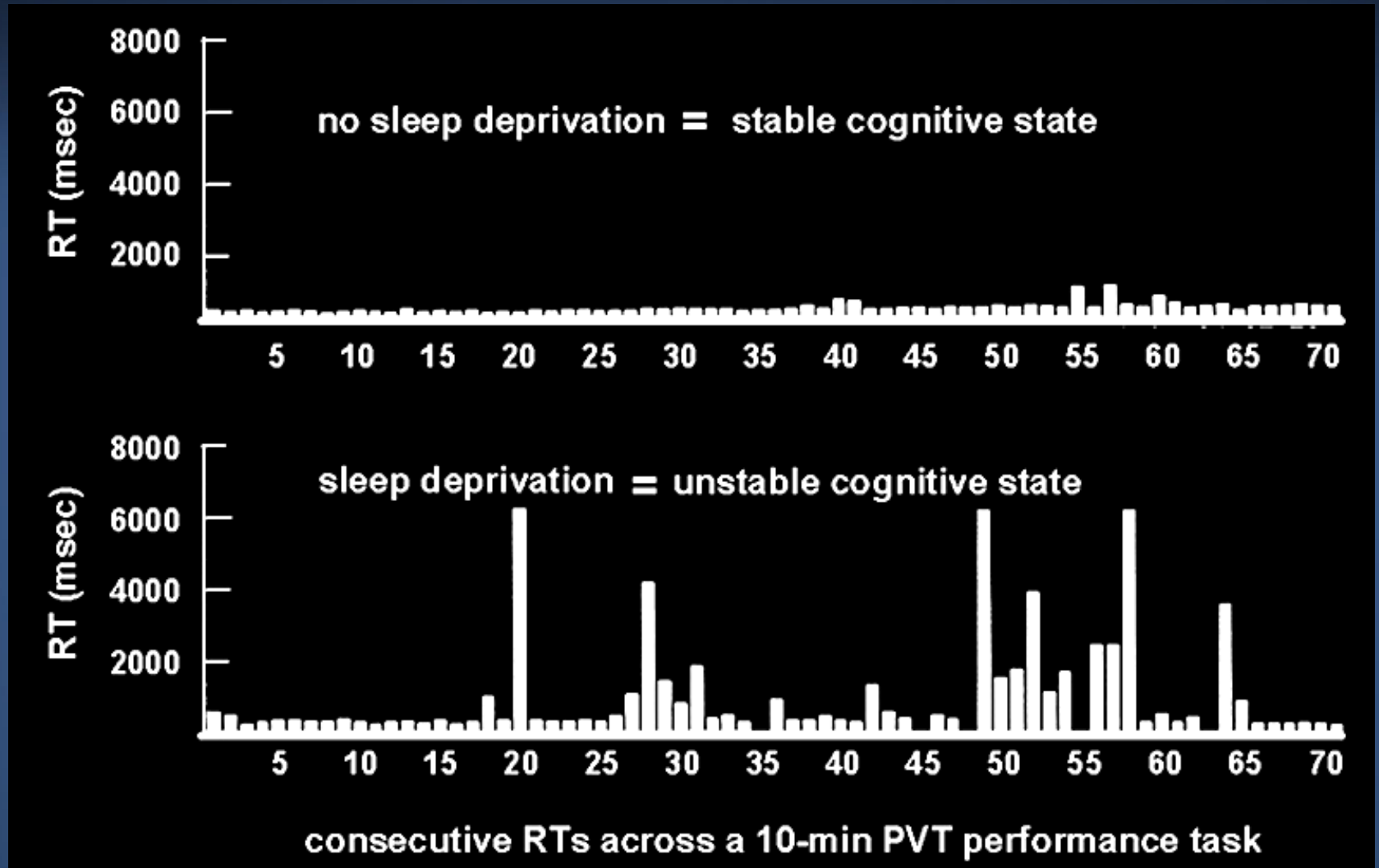
- reaction time
- judgment
- memory
- attention
- communication
- mood
- situational awareness

- increased:

- irritability
- attentional lapses
- apathy
- microsleeps



# Fatigue and Reaction Times





#2: NTSB recommendations  
address fatigue.



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# NTSB Safety Recommendations: Fatigue

- 40 years ago: May 10, 1972
- “Revise FAR 135 to provide adequate flight and duty time limitations.” (A-72-55)
- Classified “Closed-Unacceptable”





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### MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives. The following are ten of the current issues.



Addressing Human  
Fatigue



General Aviation  
Safety



Safety Management  
Systems



Runway Safety



Bus Occupant Safety



Pilot & Air Traffic  
Controller  
Professionalism



Recorders



Teen Driver Safety



Addressing Alcohol-  
Impaired Driving



Motorcycle Safety



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# NTSB Safety Recommendations: Fatigue

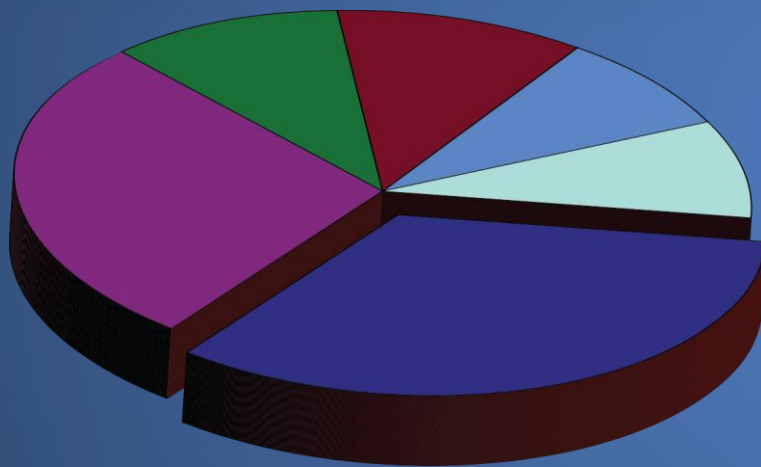
- MOST WANTED since 1990
- ~200 fatigue recommendations





# Complex Issue:

## Requires Multiple Solutions



- Scheduling Policies and Practices
- Education/Awareness
- Organizational Strategies
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation



# NTSB Fatigue Recommendations: Education/Strategies

- Develop a fatigue education and countermeasures training program
- Educate operators and schedulers
- Include information on use of strategies: naps, caffeine, etc.
- Review and update materials



# Scheduling Policies and Practices

Victoria, Texas, January 2, 2008



Victoria, Texas Fire Department

- Day sleep, night drive, ~ 4 am WOCL



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# NTSB Fatigue Recommendations: Hours of Service / Scheduling

- Science-based hours of service
- Allow for at least 8 hours of uninterrupted sleep
- Fatigue mitigation strategies in the hours-of-service regulations for passenger-carrying drivers who operate during the nighttime window of circadian low
- Reduce schedule irregularity and unpredictability





# Sleep Apnea

Mexican Hat, UT, January 6, 2008



- 360 rollover, 50/53 ejected, 9 fatalities, OSA (-CPAP)



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# NTSB Fatigue Recommendations: Sleep Apnea/Health Related

- Develop standard medical exam to screen for sleep disorders; require its use
- Educate companies and individuals about sleep disorder detection and treatment, and the sedating effects of certain drugs
- Ensure drivers with apnea are effectively treated before granting unrestricted medical certification



# Owatonna, MN (July 31, 2008)



8 fatalities



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# Owatonna, MN (July 31, 2008): Safety Recommendations

7. Revise regulations and policies to permit appropriate use of prescription sleep medications by pilots under medical supervision for insomnia.
9. Review the policy standards for all common sleep-related conditions, including insomnia, and revise them in accordance with current scientific evidence to establish standards under which pilots can be effectively treated for common sleep disorders while retaining their medical certification.



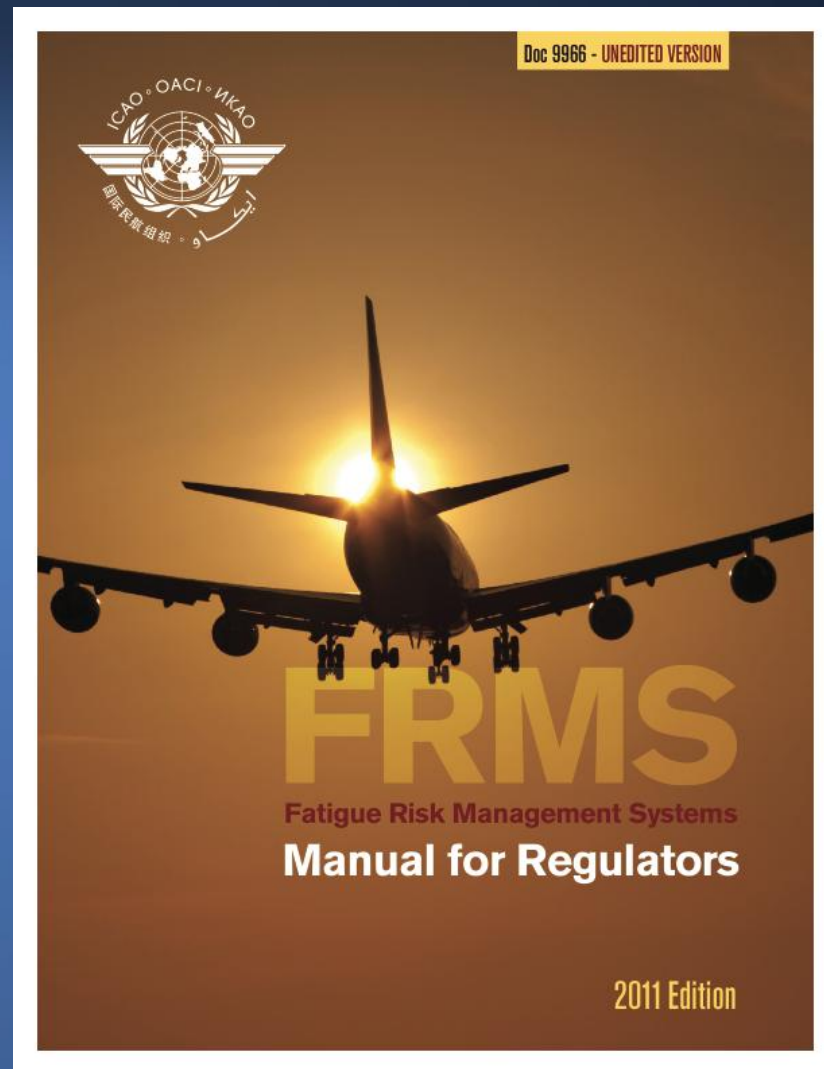
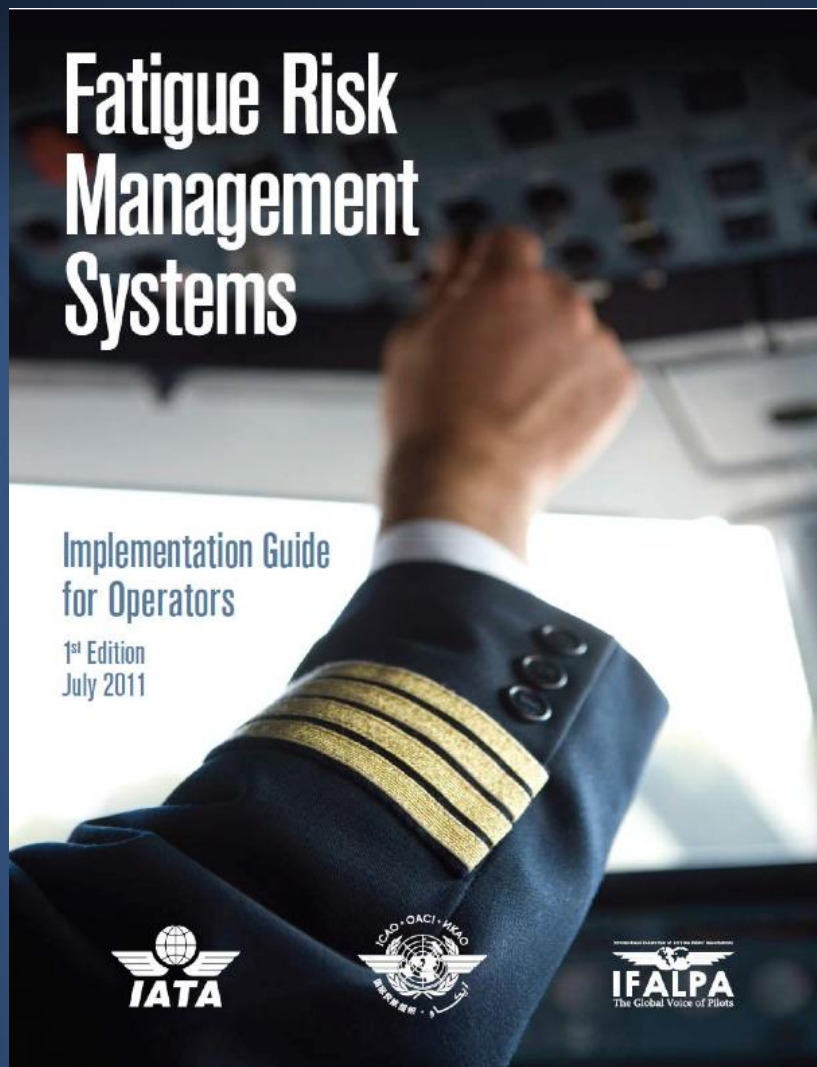


# NTSB Fatigue Recommendations: Fatigue Management Systems

- Develop guidance based on empirical and scientific evidence for operators to establish fatigue management systems
- Establish an ongoing program to monitor, evaluate, report on, and continuously improve fatigue management programs implemented by motor carriers to identify, mitigate, and continuously reduce fatigue-related risks for drivers.



# Examples



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# NTSB Safety Recommendations: Fatigue Status (May, 2012)

- Total: 194
- Open: 48
- Closed: 146
- CUN\*: 26

CUN = closed unacceptable



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# #3: Significant Societal Discrepancy





# #3: Significant Societal Discrepancy

Scientific knowledge  
vs.  
Attitudes and behaviors



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# #3: Significant Societal Discrepancy

- Underestimate prevalence
- Individual risk



# #3: Significant Societal Discrepancy

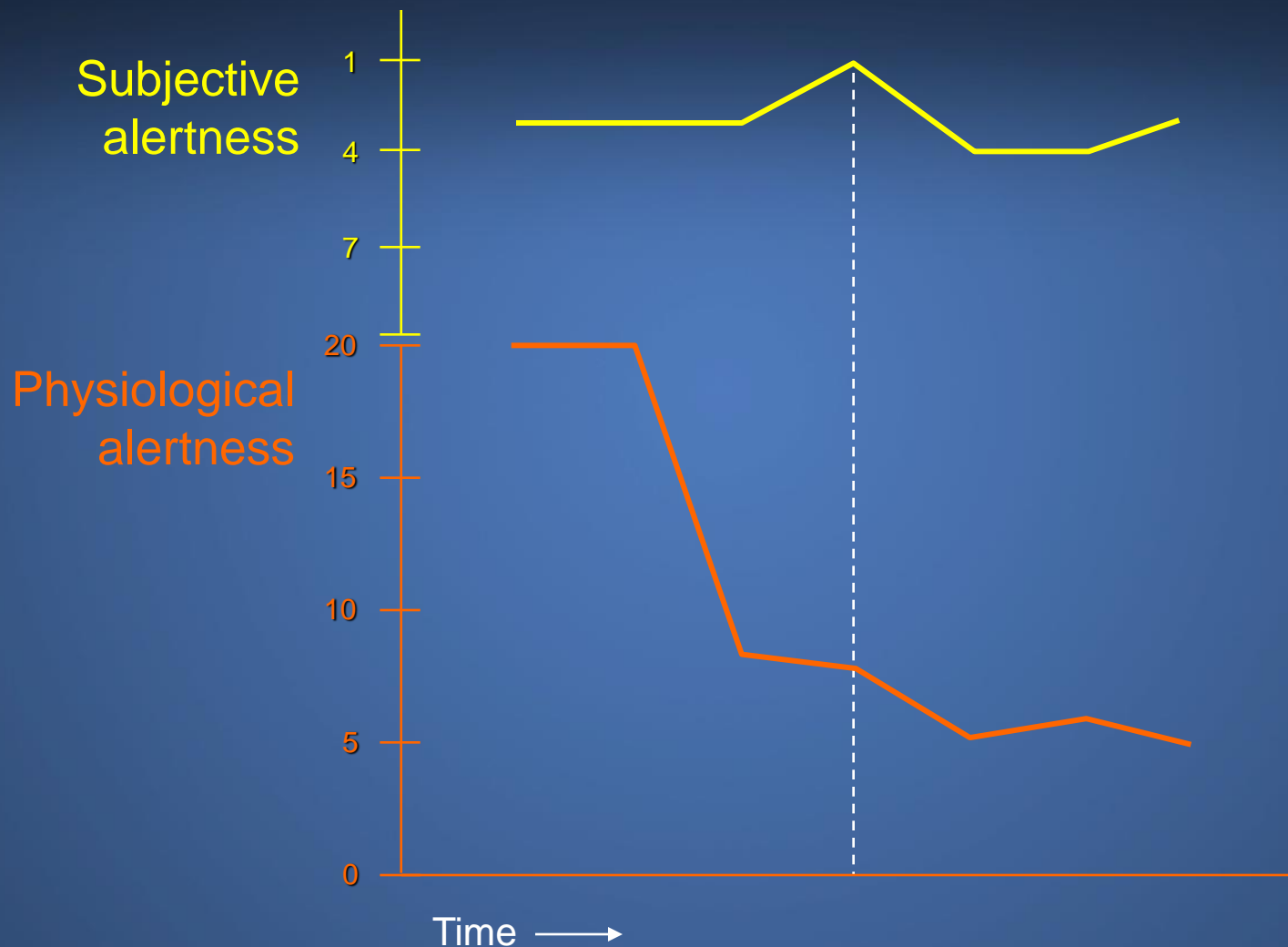
## -- Underestimate Prevalence

- all crashes involving drowsy drivers: ~ 80%
- fatal crashes involving drowsy drivers: > 350%

AAA Foundation for Traffic Safety



# Alertness Reports Often Inaccurate



Adapted from Sasaki et al., 1986



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# Pervasive Culture Change: New Attitudes and Behaviors

- Society
- Industries
- Organizations
- Individuals





# National Transportation Safety Board

## Animation of Accident Reconstruction

### Motorcoach Run Off Road-Collision with Bridge Signpost

Interstate Highway 95 Southbound  
New York, New York  
March 12, 2011

HWY11MH005

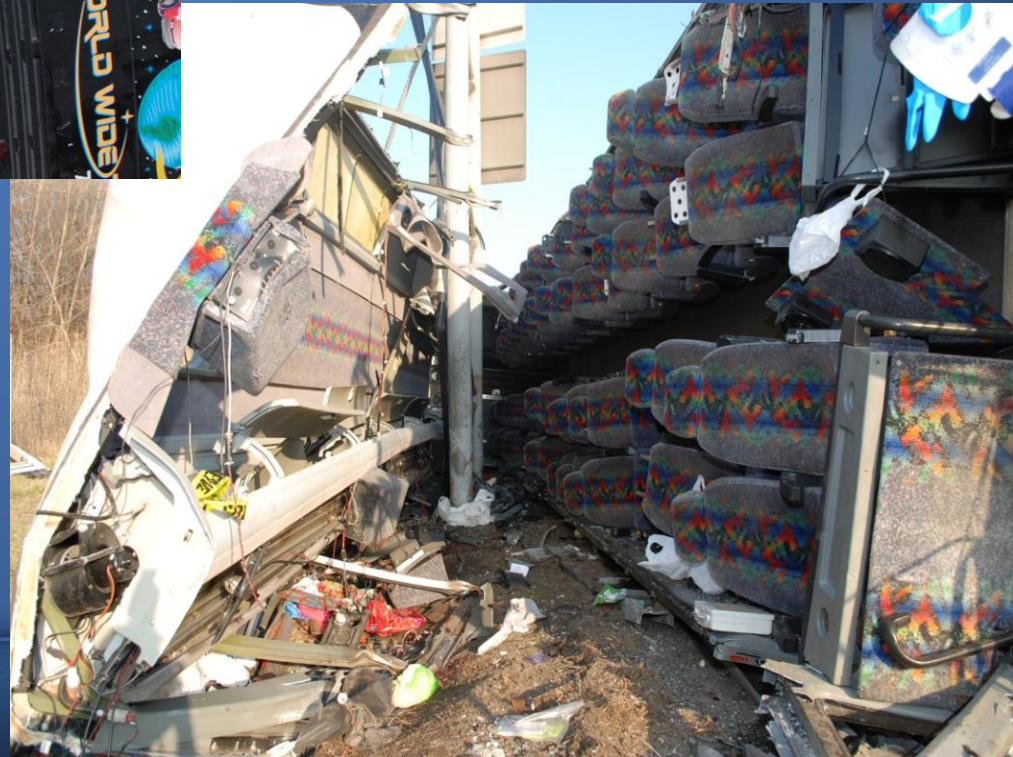


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# 'Bronx Bus', New York, NY (March 12, 2011)



15 fatalities  
17 injuries





# Probable Cause

“The National Transportation Safety Board determines that the probable cause of the accident was the motorcoach driver's failure to control the motorcoach due to fatigue resulting from failure to obtain adequate sleep, poor sleep quality, and the time of day at which the accident occurred.”





# Manage Fatigue = Enhance Safety

- Promote culture change
- Educate everyone
- Acknowledge risks
- Take action!



# Your Personal Role/Responsibility

Be an educator

Challenge attitudes

Enact change

Personal life

Family

Workplace

Organization

Model good sleep behavior



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Good sleep, safe travels.



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